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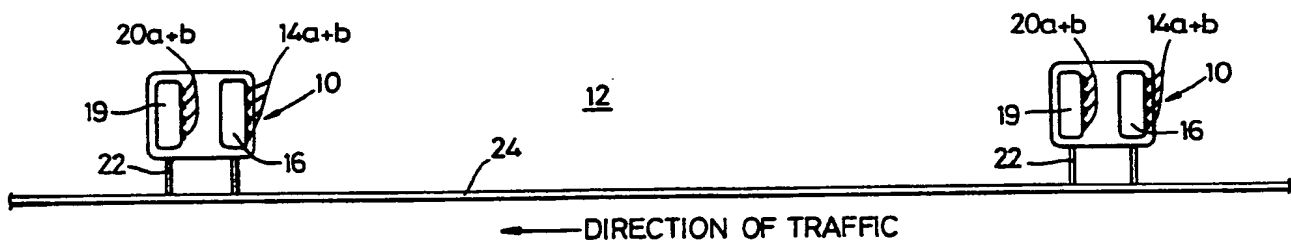
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(54) **Traffic regulation system**

(57) Traffic regulation system includes a series of light responsive elements (20) spaced at intervals along the track (e.g. road) which respond to vehicle headlights, and a series of light emitter elements (14) also spaced along the track to be visible to operators of approaching vehicles, each light responsive element being connected by fibre optic cabling (22, 24) or other transmitting or transducer means to light emitter elements rearwardly of that particular location so that the light emitting elements along the track are activated sequentially in response to the headlights of a vehicle travelling ahead to provide a visible warning to following vehicles or vehicles on an intersecting course of the presence and distance ahead of the first vehicle. (Fig. 1 is a plan view). Distinct series of emitting elements may be interconnected to provide warning of respective zones of spacing between vehicles following each other, using red and amber light respectively.



**Fig.1**

At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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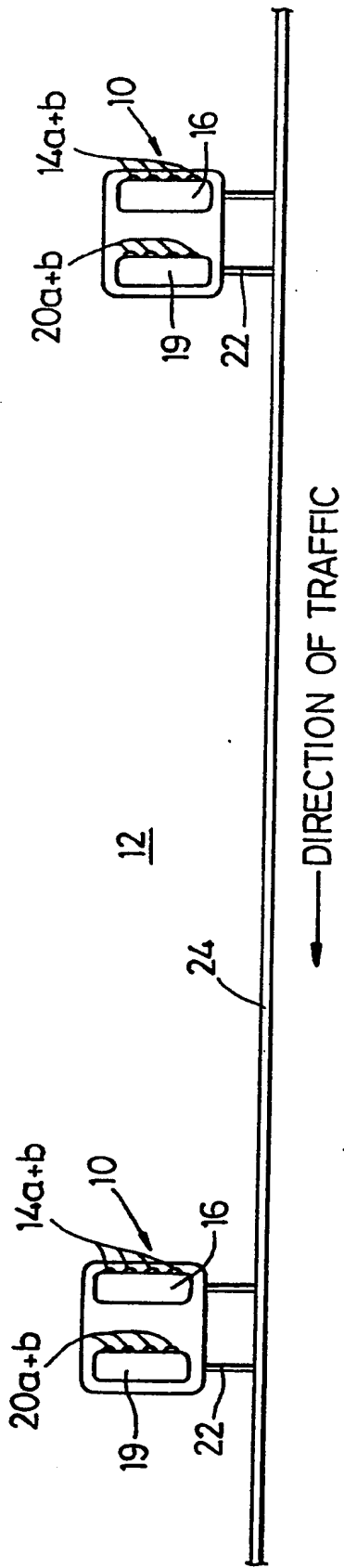


Fig. 1

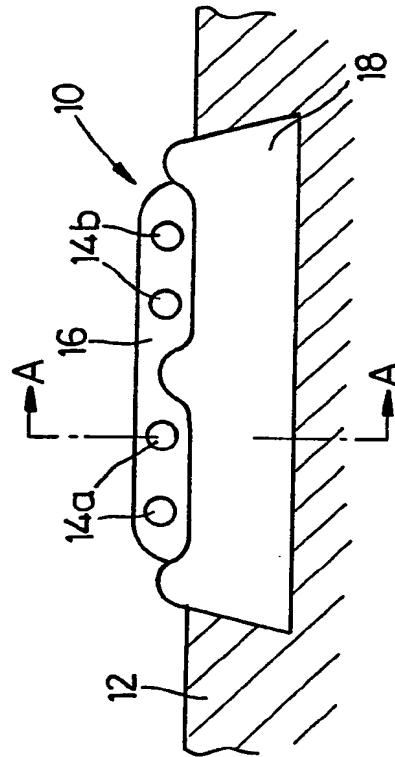


Fig. 2

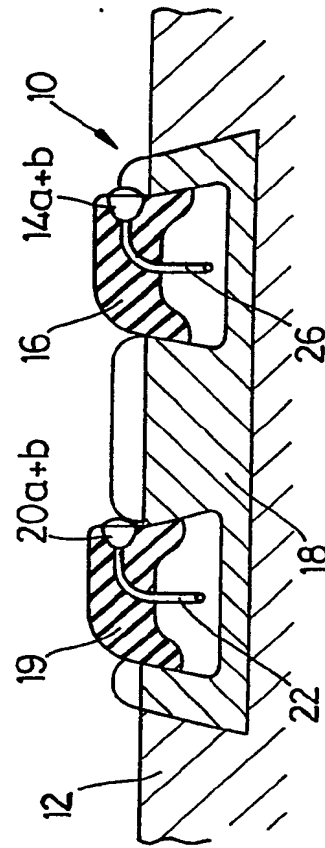
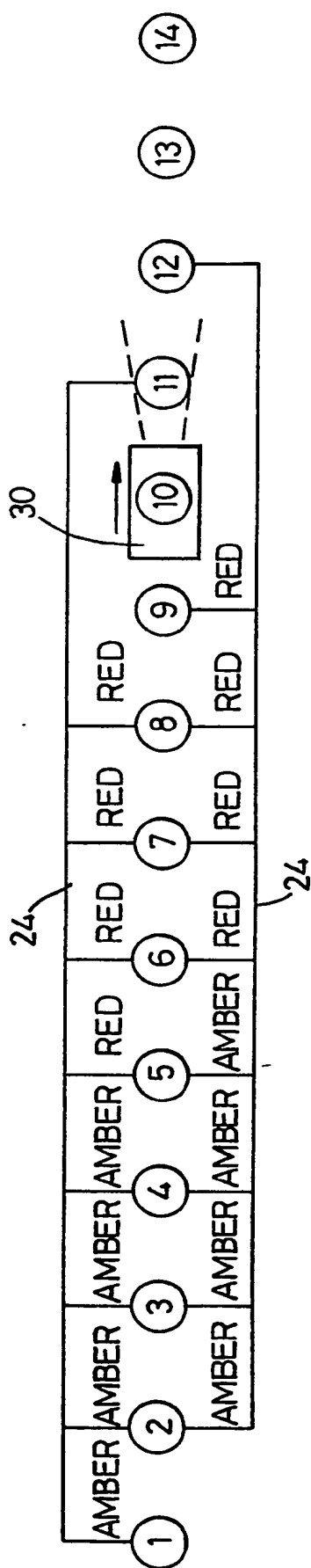


Fig. 3



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Fig. 4

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TRAFFIC REGULATION SYSTEM

This invention relates to a track based traffic regulation system for promoting greater safety during transit of vehicles thereon. While particularly applicable to road traffic it may also have application to other track based traffic flows such as rapid transit rail systems and other railways, and traffic movement on airport runways and aprons or other specialized environments such as factories and warehouses.

The object of the invention is to provide a system which is particularly effective in enhancing safety under conditions of obstructed or poor visibility such as fog in particular (but not exclusively) by promoting safe spacing between fast moving vehicles travelling in the same direction as on a motorway.

Systems have been proposed for monitoring spacing between following vehicles and providing a warning to drivers if spacing drops below the safe stopping distance at the speed in question but most known systems involve special adaptation of the vehicles themselves which is costly and means that a system can only become fully effective if all vehicles are so fitted. Passive track based warning or reminder systems such as warning signs, illuminated speed limit indications and the like are commonly ignored by drivers even if obedience is made mandatory. Adverse conditions make active Police patrolling and detection of infringements themselves difficult and dangerous. Passive systems still depend on the driver's judgement or awareness of his or her speed and distance from the vehicle in front.

According to the invention there is provided a track based traffic regulation system including a series of light responsive elements spaced at intervals along at least part of the track and positioned to respond to light emitted from headlights of vehicles using the track

or that part thereof and a series of light emitter elements also spaced along the track at locations visible to operators of vehicles approaching those locations along the track, each light responsive element being connected by transmitting or transducer means to one or more selected light emitter elements rearwardly thereof or otherwise remote therefrom so that the latter are activated sequentially in response to the headlights of a vehicle travelling ahead to provide a visible warning to a following vehicle or vehicle on an intersecting course of the presence and distance ahead of the first vehicle.

Conveniently, in the case of a motorway or other road the light responsive and emitter elements will be mounted in the track surface, conveniently in the manner of "cat's eyes" and they may also define lanes of the road in the manner of conventional cat's eye road studs.

Preferably the groupings or sequences of interconnected elements are directly connected by light transmitting means, which could be fibre optic cables, whereby the emitter elements are directly illuminated by light transmitted from the light responsive elements but it is also contemplated that transducer devices could be used e.g. to convert light acting on the responsive elements to an electric or other signal for activating sources of illumination energizing the emitter elements.

It is also contemplated that on receiving an activating signal from the associated light responsive element or elements the emitter elements would be triggered to switch them from a non-reflective to a reflective condition so that they were then illuminated by incident light, i.e. by the headlights of said following or intersecting vehicle, rather than being illuminated as referred to above.

The emitter elements may be adapted to provide distinctive demarcation of zones of actual distance between the vehicles as by being interconnected or

otherwise operated to emit different colours, e.g. green, amber, and/or red depending on whether there is a safe, near safe or dangerously close spacing.

An example of the invention is now more particularly described with reference to the accompanying drawings wherein:

Figure 1 is a diagrammatic plan view of two of a series of warning stud assemblies installed along a lane of a motorway or other road.

Figure 2 is a front elevation of one said stud assembly

Figure 3 is a longitudinal section thereof, and

Figure 4 is a diagram of sequential interconnection between a series of the stud assemblies.

Stud assemblies 10 are secured in the surfacing 12, of a lane of a motorway or other road carriageway in the manner of the conventional "cat's eye" studs and they may be spaced along the lane at intervals of, for example, 5 metres.

Each stud assembly 10 comprises two pairs of light responsive elements 14a, 14b located to face the oncoming traffic and carried in a first flexible rubber cushion 16 mounted in a forward part of a body 18 of the stud assembly. Surrounding portions of the body project somewhat above the road surface and the cushion 16 is retractable in the body if a road wheel passes over it, this also providing a wiping action to keep lens portions of elements 14 clean in known manner.

Also mounted within body 18 to the rear of cushion 16 is a further flexible and retractable cushion 19 carrying two pairs of forwardly directed light responsive elements 20a, 20b. The elements 14 and 20 are paired for duplication to ensure continued operation if any one of each pair should be damaged. Again lens portions of elements 20 will be wiped by retraction of cushion 19 into body 18.

The light responsive elements 20 are partly shielded by the upstanding parts of body 18 and the forward cushion 16 so that illumination from the headlights of an approaching vehicle will only reach them fully when that vehicle is within a certain distance from that stud assembly but the forward light emitting elements 14 are unobstructed and will be visible to an approaching vehicle from some distance.

The elements are not intended to be reflective, though there may be some minor reflection from their exposed lens shaped faces. They do not directly return light impinging on them. It is contemplated that the stud assembly may also include conventional reflective studs for lane guidance, e.g. reflecting white light in conventional manner, if required.

Each light responsive element 20 is shaped to provide, or otherwise incorporate a small optical system of lens or lenses and/or prisms to concentrate the light received and transmit it along a respective optical fibre connecting cable 22 which is in turn connected to main optical fibre cabling 24 linking the sequence of assemblies 10 along the carriageway. Further optical fibre cables 26 lead from the main cable to the emitter elements 14, again these incorporate suitable optics for emitting light transmitted thereto focused towards the oncoming traffic, elements 14a emitting amber light and elements 14b red light in this example.

The stud assemblies 10 along the carriageway are interconnected sequentially in the manner shown diagrammatically in Figure 4. A series of the assemblies, numbered sequentially 1-14 in the direction of travel of vehicles along the respective carriageway lane from left to right in Figure 4 have the light responsive elements 20 of each assembly connected to the light emitting elements 14 of in this example eight of the assemblies rearwardly thereof.

Taking the assembly number 11 in Figure 4 one pair of light responsive elements 20 is connected to the amber

light emitting elements 14 of the four assemblies numbered 1-4 which are spaced rearwardly thereof omitting the intervening elements 5-10. Thus when these responsive elements are illuminated by the headlights of an approaching vehicle indicated diagrammatically at 30 the amber emitter elements in a zone 35-50 metres rearwardly of assembly 11 will be illuminated, i.e. a distance of about 30 metres from vehicle 30.

At the same time the light responsive elements 20b of assembly 11 will also be illuminated and these are interconnected to the red emitter elements 14b of a sequence of closer assemblies 5-8 defining a danger zone to the rear of vehicle 30 some 25 metres in extent. As the vehicle passes forward further assemblies will be progressively activated, thus the responsive elements 20a of assembly 12 are connected to the amber emitter elements 14a of assemblies 2-5 and its responsive elements 20b are connected to the red emitter elements 14b of assemblies 6-9 and this sequential illumination of the red and amber elements will continue at a rate determined by the speed of vehicle 30 sequentially along the traffic lane.

Thus a following vehicle will have a readily visible indication independently of obstructions or poor visibility such as darkness, fog, rain etc not only that there is a vehicle in front but also of its spacing ahead and the speed at which it is moving or whether it has stopped. For safety a following vehicle should keep clear behind the amber illuminated elements and will know that if it approaches the red illuminated elements it is getting far too close for safety.

The sequential illumination of the elements increases awareness of following vehicles without being unduly distracting and is much more easy to monitor, even sub-consciously, than non-interactive warning signs. Moreover, warnings become available immediately vehicles use their headlights, they are not dependent on adverse conditions being sensed by traffic authorities or road-side monitoring equipment. Most, if not all, vehicles



will turn on their headlights even when encountering isolated banks of fog or the like and this will provide instant warning to following vehicles. As responsible drivers become familiar with the system they will also make deliberate use of it to provide a warning to following vehicles e.g. of obstructions or accidents ahead. Drivers will know that if the sequence of illuminated studs is not moving ahead there is a stationary obstruction and they should be able to stop in ample time, their headlights in turn warning vehicles behind them of the adverse conditions.

It will be appreciated that interconnection between the stud assemblies and their spacing can be varied according to local road conditions and normal traffic speeds. There may even be the possibility of selective control by switching to increase or decrease the chains of illuminated assemblies associated with each assembly ahead.

While the fibre optic direct interconnection of the light responsive and light emitting elements is preferred as not requiring any external power source and for durability and reliability once installed it is also contemplated that electrically powered systems might be used in some circumstances for sequential illumination of light emitting elements in the form of warning lights, signs and the like rearwardly of the associated light responsive elements and the latter could be transducers converting the light input to electric signals or the like. Transmission between the assemblies may also be by various means, e.g. fibre optic or electrical cabling or possibly by infra-red, radio or other transmitter means.

It is contemplated that the invention might also have application in providing a warning to a vehicle of the presence of another vehicle on an intersecting course eg at or approaching a bend, road junction, merging traffic lines, or other hazard where the vehicles are travelling towards each other or converging rather than in following relationship as described above.

CLAIMS

1. A track based traffic regulation system including a series of light responsive elements spaced at intervals along at least part of the track and positioned to respond to light emitted from headlights of vehicles using the track or that part thereof and a series of light emitter elements also spaced along the track at locations visible to operators of vehicles approaching those locations along the track, each light responsive element being connected by transmitting or transducer means to one or more selected light emitter elements rearwardly thereof or otherwise remote therefrom so that the latter are activated sequentially in response to the headlights of a vehicle travelling ahead to provide a visible warning to a following vehicle or vehicle on an intersecting course of the presence and distance ahead of the first vehicle.

2. A system as in Claim 1 wherein the light responsive and light emitter elements are adapted to be operatively mounted in the track surface.

3. A system as in Claim 1 or 2 wherein the interconnected light responsive and light emitter elements are directly connected by light transmitting means whereby the emitter element or elements are directly illuminated by light transmitted from the light responsive element or elements.

4. A system as in Claim 3 wherein said light transmitting means includes fibre optic cables.

5. A system as in Claim 1 or 2 wherein the interconnected light responsive and light emitter elements are connected through transducer means wherein light acting on the responsive element or elements causes the transmission of an electric or other signal to activate sources of illumination energizing the emitter element or elements.

6. A system as in Claim 1 or 2 wherein the

interconnected light responsive and light emitter elements are connected through transducer means activated by light acting on the responsive element or elements to provide a signal triggering the emitter element or elements to switch them from a non-reflective to a reflective condition to emit incident light falling thereon from the headlights of approaching vehicles in use.

7. A system as in any preceding claim wherein the emitter elements are adapted to provide distinctive demarcation of zones of actual distance between the vehicle.

8. A system as in Claim 7 wherein the emitter elements are interconnected or otherwise operated to emit different colours in demarcation of said zones.

9. A system as in any preceding claim wherein elements at each location are duplicated so that the system remains operational if an element should be damaged.

10. A system as in any preceding claim comprising a plurality of assemblies each for installation at respective spaced locations along the track and each incorporating one or more said light emitter elements to be activated in response to light responsive elements of assemblies ahead of that respective location, and one or more light responsive elements operatively connected to activate the light emitter elements of one or more said assemblies rearwardly of the respective locations.

11. A system as in Claim 10 wherein the light emitting element or elements of each assembly are located in a part nearest to approaching vehicles and the light responsive element or elements thereof are located in a part of the assembly further away from approaching vehicles and partly shielded so that they are only fully illuminated when an approaching vehicle is within a certain distance from that assembly.

12. A system as in Claim 10 or 11 wherein each said assembly incorporates first and second light emitting elements which respectively emit distinctively different colours of light and which are each operatively interconnected to the light responsive elements of respective sets of assemblies spaced nearer to and further from the location of said assembly so that a first colour of light is emitted when an activating vehicle is more than a given distance ahead of that location and light of another colour is emitted when the vehicle is less than said distance ahead of that location.

13. A system as in Claim 10, 11 or 12 wherein the elements of each assembly are carried in flexible cushion means retractable into a body of the assembly if passed over by a road wheel, said retraction also providing a wiping action to keep lens portions of the elements clean.

14. A track based traffic regulation system substantially as hereinbefore described with reference to and as shown in the accompanying drawings.

15. A carriageway for road vehicles including a regulation system as in any preceding claim.

16. A carriageway as in Claim 15 wherein the elements of the system also serve to demarcate a lane or lanes of the carriageway.

**Patents Act 1977**

**E miner's report to the Comptroller under  
Section 17 (The Search Report)**

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Application number

9109430.0

**Relevant Technical fields**

- (i) UK CI (Edition K ) G4Q (QAC, QAJ, QBAE, QBAF, QCE, QCF)  
E1G (GLP)
- (ii) Int CL (Edition 5 ) G08G, B61L, E01F

Search Examiner

M J DAVIS

**Databases (see over)**

(i) UK Patent Office

(ii)

Date of Search

28 MAY 1992

Documents considered relevant following a search in respect of claims

1-16

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	GB 2230368 A (MARCONI) whole document	-
X	WO 88/07560 A1 (SECRETARY OF STATE) whole document	1-5, 7-10, 13, 15, 16

SF2(p)

1SF - c:\wp51\doc99\fil000512

Category	Identity of document and relevant passages	Relevant to claim(s)

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